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FLOOD INSURANCE STUDY

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ORIGINAL

TOWN OF GREENBUSH, MAINE
PENOBSCOT COUNTY

SEPTEMBER 4, 1987

Federal Emergency Management Agency

COMMUNITY NUMBER - 230107

CDD

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
TOWN OF GREENBUSH, PENOBSCOT COUNTY, MAINE

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Greenbush, Penobscot County, Maine, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the U. S. Geological Survey (USGS) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1823, Project Order No. 5. This work was completed in June 1986.

1.3 Coordination

In December 1984, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives from FEMA, the town, and the USGS (the study contractor) to determine the streams to be studied by detailed methods. During the course of the work, flood elevations and flood boundaries were reviewed with community officials. In July 1986, an intermediate CCO meeting was held with town officials to review the study in progress.

On October 2, 1986, a final CCO meeting was held with representatives from FEMA, the town, and the study contractor to review the results of the study.

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2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Greenbush, Penobscot County, Maine. The area of study is shown on the Vicinity Map (Figure 1).

The following streams were studied by detailed methods: the Penobscot River, for its entire length within the corporate limits; and Olamon Stream, from the head of the falls (near its confluence with the Penobscot River) to the downstream side of Spring Bridge Road. The Penobscot River effects flows on Hazelton Brook and Side Channel. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through June 1991.

The following streams were studied by approximate methods: Halfway Brook, Buzzy Brook, Whitney Brook, Otter Brook, and portions of Olamon Stream. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Town of Greenbush.

2.2 Community Description

The Town of Greenbush is located in the south-central portion of Penobscot County, approximately 23 miles north-northeast of the City of Bangor, in central Maine. The town is bordered by the Town of Passadumkeag to the north, the Township of Summit to the northeast, the Town of Greenfield to the southeast, the Town of Milford to the south, and the Town of Argyle and the Penobscot River to the west. The land area of the town is 49.4 square miles with an average population density of 22 persons per square mile (Reference 1). In 1980, Greenbush had a population of 1,064, an increase of 80 percent over the 1970 census (Reference 2).

Greenbush is primarily a residential community and many of its residents work outside of the town. In the town itself, only a limited number of small, privately owned businesses are found. Olamon, a village located in Greenbush, is the most densely populated area in the town and presently all the houses are above the floodplains.

Ninety-eight percent of the town is forest covered. Agriculture in Greenbush is limited to small areas along the Penobscot River. There is also some agricultural land near the two eskers that cut through the town between the Penobscot River and large swamp areas to the east.

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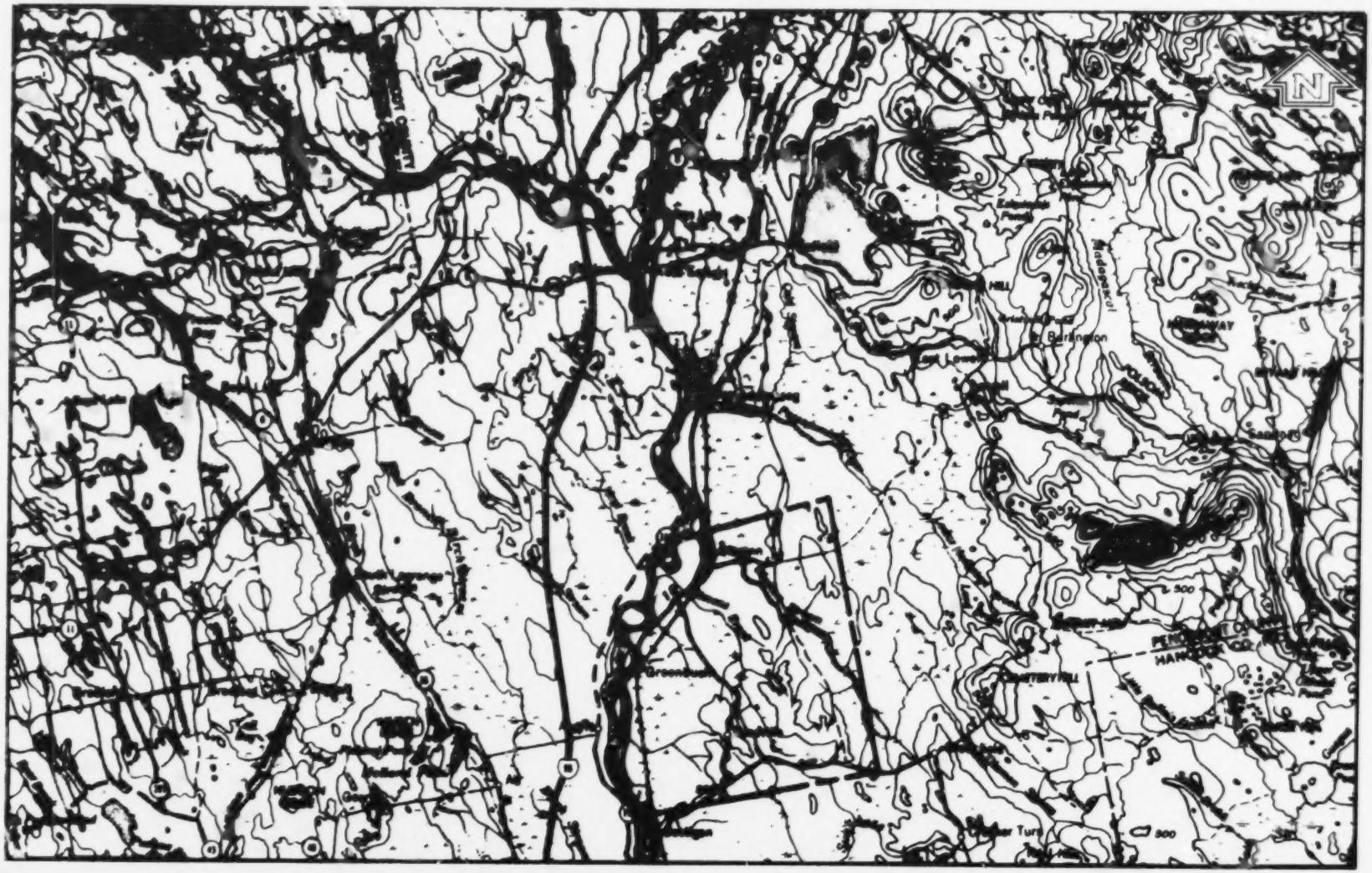

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF GREENBUSH, ME
(PENOBSCOT CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

Greenbush is located in the south portion of the Penobscot River basin. The Penobscot River originates at the confluence of the East and West Branches and flows south for approximately 67 miles to tide water at Bangor. The Penobscot River drains approximately 27 percent of the State of Maine.

The headwater lakes and streams that contribute to the discharge of the Penobscot River flow through a mountainous region with peak elevations of as much as 5,267 feet. The Penobscot River flows south from Medway to Bangor through a region of low relief with the hills near the river rising to elevations of approximately 300 to 400 feet. For its length from Medway to Bangor, the river drops a total of approximately 240 feet at a fairly uniform slope that averages 3.2 feet per mile.

Olamon Stream has a drainage area of 52.4 square miles at its confluence. It flows in a northwest direction from its headwaters to its confluence with the Penobscot River. Olamon Stream has a very gentle slope in the area just above the ledge near its confluence with the Penobscot River. In Greenbush, the area adjoining Olamon Stream consists of a wide swale and swamp area.

The climate of Greenbush is typified as humid continental. The summers are moderate with temperatures averaging between 60 degrees Fahrenheit (°F) and 70°F in July and August. Its winters are fairly cold with temperatures averaging between 15°F and 20°F in January and February. The mean annual temperature is approximately 43°F. The average annual precipitation is approximately 40 inches and is evenly distributed throughout the year (Reference 3).

2.3 Principal Flood Problems

Severe flooding in Greenbush is limited to the floodplains of the Penobscot River and Olamon Stream. On these streams, flooding generally occurs in the spring months from rapid runoff caused by heavy rains combined with snowmelt and, less frequently, as a result of hurricanes. Significant flooding has occurred on the Penobscot River in past years.

On the Penobscot River, repeated damage to bridges and other important structures in the floodplain has occurred in 1923, 1936, 1940, 1973, and 1983 with frequencies of 120, 35, 20, 40, and 25 years, respectively. Extensive damage to property, streets, and structures occurred during these floods. The flood of 1936, although not as high in flow as either the 1923 and 1973 floods, resulted in considerable damage due to ice jams.

USGS gage No. 01034500 located at West Enfield on the Penobscot River and USGS gage No. 01045000 located at Lowell on the Passadumkeag River were

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used for the hydrologic analyses in this study. Records at the West Enfield station have been kept since 1902, and records at Lowell have been kept since 1915.

2.4 Flood Protection Measures

The natural stream flow of the Penobscot River is altered by several hydroelectric plants and storage reservoirs located upstream from Greenbush. The structure that could have the most pronounced effect on the Penobscot River is the Mattaseunk Dam at Mattawamkeag, approximately 44 miles upstream from Greenbush. It is a low-head dam presently being used as a run-of-the-river hydropower plant. The extensive amount of natural storage in the headwater lakes and existing storage developments reduce flood flows and damages. However, this storage is not always dependable for flood control since flood conditions may occur when the reservoirs are near full. The major storage lakes within the Penobscot River basin are as follows: Chesuncook, Ripogenus, and Caribou Lakes and Moose Pond controlled by Ripogenus Dam with a usable capacity of 30 billion cubic feet; Amajejus, Pemadumcook, North Twin, South Twin, and Elbow Lakes controlled by North Twin Dam with a capacity of 15 billion cubic feet; Chamberlain and Telos Lakes and Round Pond controlled by dams in outlets of Chamberlain and Telos Lakes with a capacity of 5.05 billion cubic feet; Second and Grand Lakes controlled by the dam at the outlet of Grand Lake with a capacity of 1.78 billion cubic feet; and Sebec Lake controlled by a dam at the outlet with a capacity of 2.51 billion cubic feet.

The Town of Greenbush has adopted the minimum shoreland zoning ordinance as required by the State of Maine (Reference 4). This ordinance serves to protect the lake areas by restricting building to reduce flood damage and problems.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood

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(1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

The principal source of flood-flow data for the streams in Greenbush were records of peak flows from 1902 to 1982 at USGS gage No. 01034500 for the Penobscot River at West Enfield and for the Passadumkeag River at Lowell at USGS gage No. 01045000 from 1915 to 1979. The 100-year discharge frequency relationships at the West Enfield and Lowell gages were determined by applying the log-Pearson Type III method (Reference 5).

The 100-year flood discharge at the upstream corporate limits of Greenbush represents the 100-year flood discharge of the Penobscot River at West Enfield plus the 100-year flood discharge of the Passadumkeag River at Lowell adjusted on the basis of drainage area to represent flow conditions at its confluence. Flood flows for the Penobscot River at the downstream corporate limits of Greenbush were determined by adjusting flows determined for the upstream corporate limits by a drainage-area ratio.

In addition, a discharge-frequency relationship for the Penobscot River was recently reported by a U. S. Army Corps of Engineers (COE) analysis (Reference 6). The COE analysis was also used in the Howland Flood Plain Management Study, conducted by the Soil Conservation Service (SCS) (Reference 7). Daily mean discharges recorded by the Bangor Hydro-Electric Company since 1914 were used in the COE analysis. Results of the COE analyses were in close agreement with those determined in this study.

The values of the 100-year magnitude flow for Olamon Stream were obtained using equations developed by R. A. Morrill, whose methods are outlined in the USGS Open-File Report 75-292 (Reference 8). These equations relate flood flows to the following basin characteristics: drainage area, main channel slope, and storage area in the basin.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

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TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
PENOBSCOT RIVER		
At Milford-Greenbush corporate limits	7,170	158,000
At Passadumkeag-Greenbush corporate limits	7,094	156,000
OLAMON STREAM		
At mouth	52.4	4,670

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data for the backwater analysis for the Penobscot River were obtained from USGS topographic maps at a scale of 1:62,500 with a contour interval of 20 feet, and topographic maps at a scale of 1:24,000 with a contour interval of 10 feet (References 9 and 10). The below-water cross sections were obtained from field surveys. All bridges were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable. The values for selected cross sections are shown in Table 2, "100-Year Flood Data."

Water-surface elevations of floods of the selected recurrence intervals were computed using the USGS step-backwater computer program (Reference 11). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations used for the profile determinations were taken from the Town of Milford Flood Insurance Study (Reference 12). Starting water-surface elevations for Olamon Stream was determined from critical depth calculations at the head of the falls in Olamon.

Backwater from the 100-year flood on the Penobscot River extend upstream to Fulton Bridge on Olamon Stream. The backwater model for the Penobscot River was calibrated using profile information available from the 1936

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FLOODING SOURCE		RIVER CHANNEL				BASE FLOOD ELEVATION
CROSS SECTION	DISTANCE [1] (FT.)	WIDTH [2] (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	STREAM-BED ELEVATION FT. (NGVD)	FT. (NGVD)
A	0	8,290	81,500	1.9	92.9	123.8
B	2,830	7,450	82,900	1.9	91.4	124.1
C	7,080	9,100	83,600	1.9	93.6	124.6
D	9,420	10,300	111,000	1.4	93.6	124.9
E	11,900	10,900	122,000	1.3	96.9	125.1
F	15,300	6,440	76,400	2.1	97.2	125.4
G	17,800	6,270	87,500	1.8	96.6	125.7
H	20,600	7,830	77,900	2.0	100.2	125.9
I	23,700	7,680	89,600	1.8	95.6	126.3
J	25,900	7,730	77,100	2.1	102.3	126.6

[1] DISTANCE IN FEET UPSTREAM FROM THE MILFORD-GREENBUSH TOWN LINE

[2] THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF GREENBUSH, MAINE
(Penobscot County)

100-YEAR FLOOD DATA

PENOBSCOT RIVER

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FLOODING SOURCE		RIVER CHANNEL				BASE FLOOD ELEVATION
CROSS SECTION	DISTANCE [1] (FT.)	WIDTH [2] (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	STREAM-BED ELEVATION FT. (NGVD)	FT. (NGVD)
K	28,400	2,170	33,700	4.7	104.2	127.0
L	32,780	5,020	36,400	4.3	102.7	130.0
M	36,500	3,960	49,100	3.2	101.3	131.2
N	38,570	2,710	35,500	4.4	108.3	131.7

[1] DISTANCE IN FEET UPSTREAM FROM THE MILFORD-GREENBUSH TOWN LINE

[2] THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF GREENBUSH, MAINE
(Penobscot County)

100-YEAR FLOOD DATA

PENOBSCOT RIVER

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FLOODING SOURCE		RIVER CHANNEL				BASE FLOOD ELEVATION
CROSS SECTION	DISTANCE [1] (FT.)	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	STREAM-BED ELEVATION FT. (NGVD)	FT. (NGVD)
A	460	-----	-----	---	120.6	134.1
B	780	-----	-----	---	120.6	134.1
C	1,180	-----	-----	---	120.0	134.1
D	1,960	-----	-----	---	120.8	134.1
E	2,850	-----	-----	---	120.8	134.1
F	3,330	-----	-----	---	121.5	134.1
G	4,300	-----	-----	---	121.6	134.1
H	5,260	-----	-----	---	121.6	134.1
I	6,000	-----	-----	---	121.8	134.1
J	6,150	803	6,980	0.7	122.5	136.6
K	7,120	1,140	8,590	0.5	122.8	136.6
L*	8,380	1,000	7,090	0.7	123.0	136.7

[1] DISTANCE IN FEET UPSTREAM FROM OLD ROUTE 2 BRIDGE IN OLAMON

NOTE: OLAMON STREAM IS INUNDATED BY BACKWATER FROM THE PENOBSCOT RIVER UP TO CROSS SECTION I.

*Located outside Corporate Limits (NOT SHOWN)

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF GREENBUSH, MAINE
(Penobscot County)

100-YEAR FLOOD DATA

OLAMON STREAM

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FLOODING SOURCE		RIVER CHANNEL				BASE FLOOD ELEVATION
CROSS SECTION	DISTANCE [1] (FT.)	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	STREAM-BED ELEVATION FT. (NGVD)	FT. (NGVD)
M	9,520	1,340	8,370	Q.6	123.0	136.7
N	11,210	1,170	8,940	0.5	122.7	136.8
O	12,200	856	6,950	0.7	123.0	136.8
P	13,170	839	7,090	0.7	123.0	136.8
Q	14,140	789	6,460	0.7	123.0	136.8
R	14,880	618	4,430	1.0	123.0	136.8
S	15,790	1,080	7,830	0.6	123.3	136.9
T	16,750	841	6,260	0.8	123.0	136.9
U	17,540	1,070	6,970	0.7	123.0	137.0
V	19,220	844	7,590	0.6	123.0	137.0

[1] DISTANCE IN FEET UPSTREAM FROM OLD ROUTE 2 BRIDGE IN OLAMON

NOTE: OLAMON STREAM IS INUNDATED BY BACKWATER FROM THE PENOBSCOT RIVER UP TO CROSS SECTION X.

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF GREENBUSH, MAINE
(Penobscot County)

100-YEAR FLOOD DATA

OLAMON STREAM

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flood at points not affected by ice jams (Reference 13). This calibration was possible because river conditions from 1936 to the present and the structures in the Penobscot River and their alignment have not changed appreciably.

Roughness coefficients (Manning's "n") used in the hydraulic computations for the Penobscot River and Olamon Stream were estimated on the basis of the maps and field inspection at each cross section in the area studied. Channel "n" values for the Penobscot River ranged from 0.035 to 0.450, and the channel "n" values ranged from 0.045 to 0.085. Channel "n" values for Olamon Stream ranged from 0.030 to 0.035, and the overbank "n" values ranged from 0.045 to 0.075.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the streams studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 10 feet (Reference 10).

For the streams studied by approximate methods, the 100-year flood boundaries were delineated using the Flood Hazard Boundary Map for the Town of Greenbush (Reference 14).

The 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds

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to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

No floodways were calculated as part of this study.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

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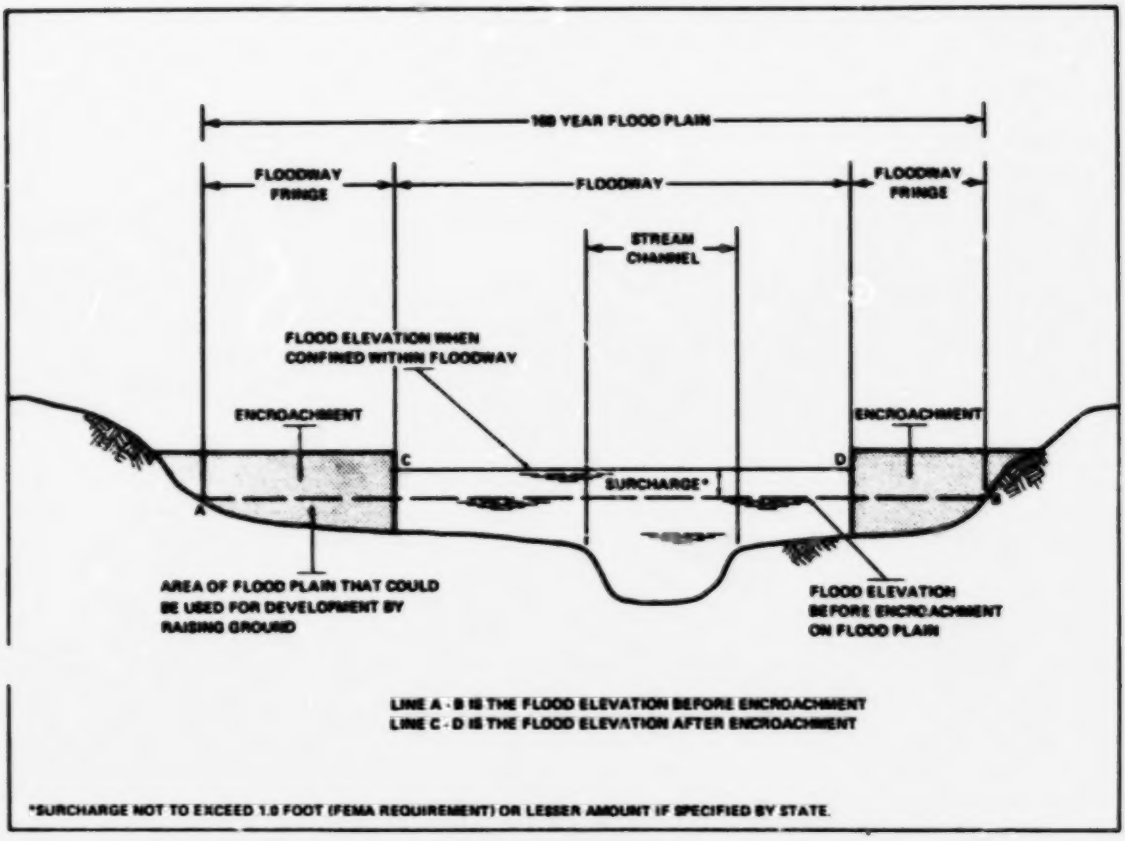
100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

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Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

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For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

7.0 OTHER STUDIES

A Flood Insurance Study for the Town of Milford has been published (Reference 12). The floodplain boundaries of this study do not match exactly with those shown in the Town of Milford study. Since floodplain boundaries for the Town of Greenbush were delineated using more current topographic information, the Town of Milford Flood Insurance Study will be updated in the future.

A Flood Insurance Study for the Town of Passadumkeag is currently being prepared (Reference 15). The results of that study will be in agreement with the results of this study.

A Flood Insurance Study for the Town of Argyle has been published (Reference 16). The approximate analysis for the Penobscot River in that study does not agree with the more detailed analyses used in this study.

Due to its more detailed nature, this Flood Insurance Study supersedes the Flood Hazard Boundary Map for the Town of Greenbush (Reference 14).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, J. W. McCormack Post Office and Courthouse Building, Room 462, Boston, Massachusetts 02109.

9.0 BIBLIOGRAPHY AND REFERENCES

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2. U. S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Maine, Washington, D. C., U. S. Government Printing Office, 1981.

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10. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 Feet: Passadumkeag, Maine (Provisional).

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13. U. S. Department of the Interior, Geological Survey, The Floods of March 1936, Washington, D. C., 1937.

14. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Greenbush, Penobscot County, Maine, May 31, 1977.

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15. Federal Emergency Management Agency, Flood Insurance Study, Town of Passadumkeag, Penobscot County, Maine (Unpublished).

16. Federal Emergency Management Agency, Flood Insurance Study, Town of Argyle, Penobscot County, Maine, Washington, D. C., September 18, 1985.

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EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	05	145.597	A Standard (National Geodetic Survey "NGS") tablet stamped "145", located 1.4 miles along the railroad track north of the Greenbush Railroad Station (abandoned), on east side of railroad track, in milestone marked "Vanceboro 90 miles, Portland 161 miles". This tablet is set vertically and about 3 feet above the land surface.
RM 2	10	144.908	A standard (National Geodetic Survey "NGS") disk stamped "144" set vertically in mile-stone marker "Vanceboro 87 miles, Portland 164 miles"; on the Passadumkeag-Greenbush Town Line, on east side of railroad track. The reference mark is about 10 feet higher than the track elevation.
RM 3	10	126.394	Top of the north upstream anchor bolt on first guard rail post on the east bank of "Old Route 2" bridge over Olamon Stream in Olamon. This bridge is the first downstream bridge below the head of the falls on Olamon Stream.

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EXHIBIT 3 - ELEVATION REFERENCE MARKS - continued

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 4	10	135.321	A standard disk stamped "26 WPL 1958 135", set in southeast wing wall of Old Lowell Road (Fulton) bridge over Olamon Stream. This bench mark is located 1.5 miles east of Olamon on Old Lowell Road.
RM 5	10	201.237	A standard (National Geodetic Survey "NGS") tablet, stamped "25 WDL 1958", set in top of a flat 10' X 10' X 2' granite boulder. This tablet is located 3.1 miles southwest of Olamon 0.65 mile south of Scotts Corner on Spring Bridge Road, 46 feet west of the road, and 18 feet southeast of the southeast corner of an old cellar hole.
RM 6	10	170.06	Top of end of a railroad spike driven about 1.5 feet above the ground in Bangor Hydro-Electric Company pole number 67-31. This reference point is located 1.15 miles south of Scotts Corner in Olamon on Spring Bridge Road, on the east side of the road.
RM 7	10	138.85	Top of the downstream south corner of highway guard rail post (H-bean). This reference mark is located 1.75 miles south of Scotts Corner in Olamon on the Spring Bridge Road, 2 feet north of the centerline of the road and Olamon stream.

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EXHIBIT 3 - ELEVATION REFERENCE MARKS - continued

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 8	15	121.999	A Standard (National Geodetic Survey "NGS") tablet stamped "122". This reference point is located 1.6 miles along railroad track south of the Greenbush Railroad Station (abandoned) on the east side of the railroad track and set vertically about 2 feet above the land surface in milestone marked Vanceboro 93 miles, Portland 158 miles.
RM *9		114.979	A Standard (National Geodetic Survey "NGS") tablet stamped "115". This reference mark is located at Costigan, 215 feet north of abandoned railroad station, in top of the center of the south concrete headwall of a trestle, 1.7 feet from the east end, and 13.5 feet east of the east rail, and 0.55 miles south of Costigan-Greenbush town line.

*Located outside corporate limits

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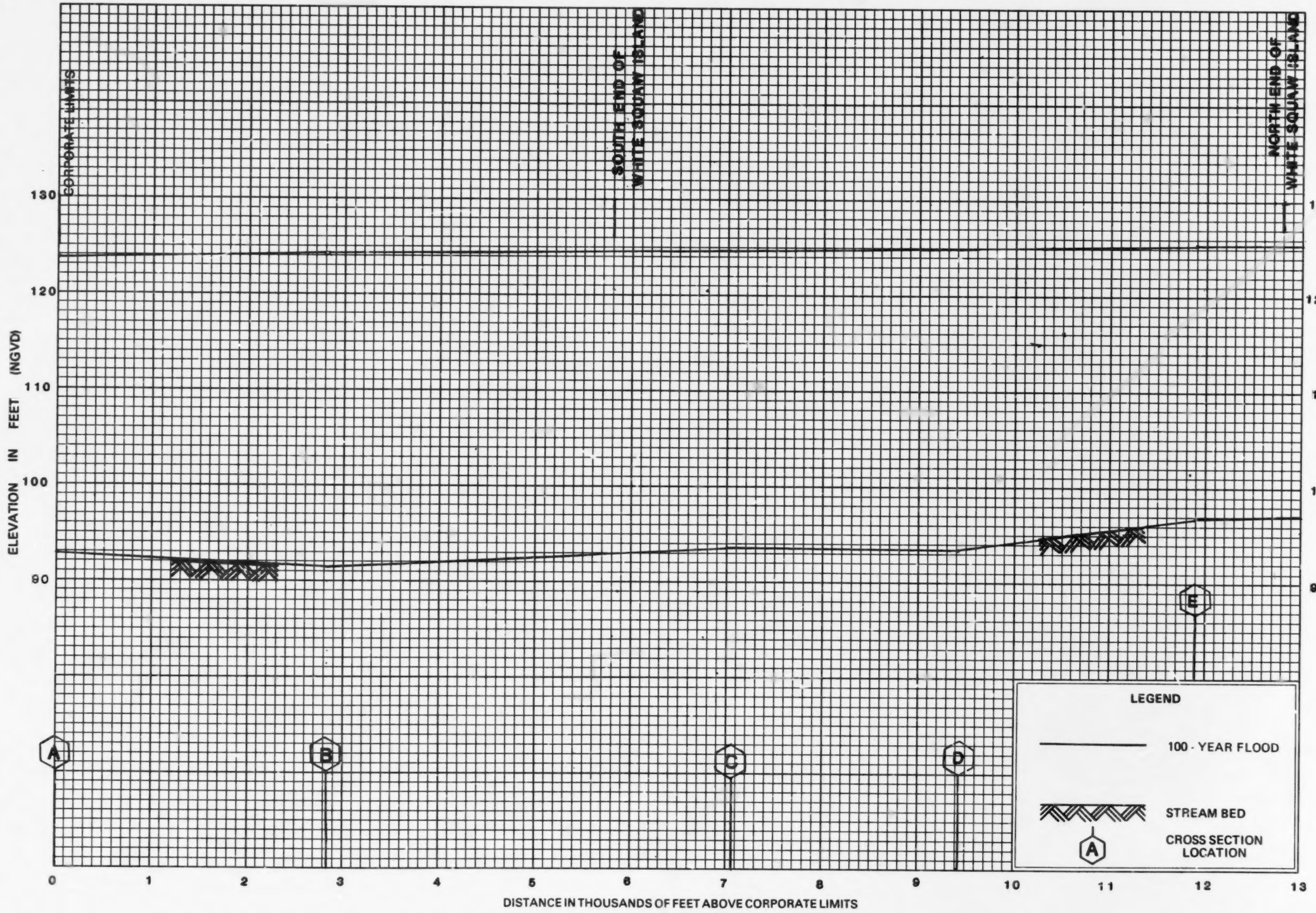

FLOOD PROFILES

PENOBSCOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GREENBUSH, MAINE
(PENOBSCOT COUNTY)

01P

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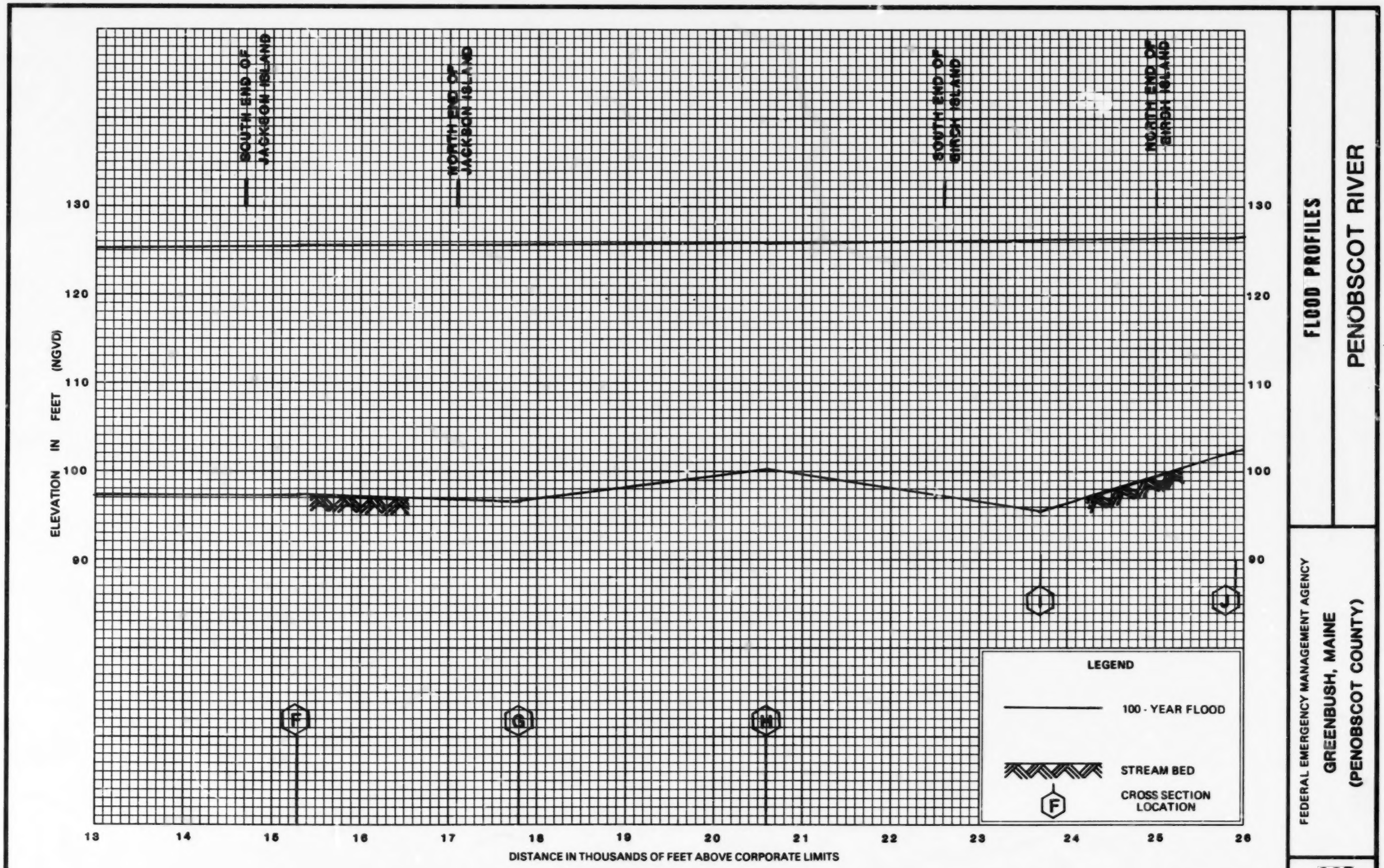

FLOOD PROFILES

PENOBSCOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GREENBUSH, MAINE
(PENOBSCOT COUNTY)

02P

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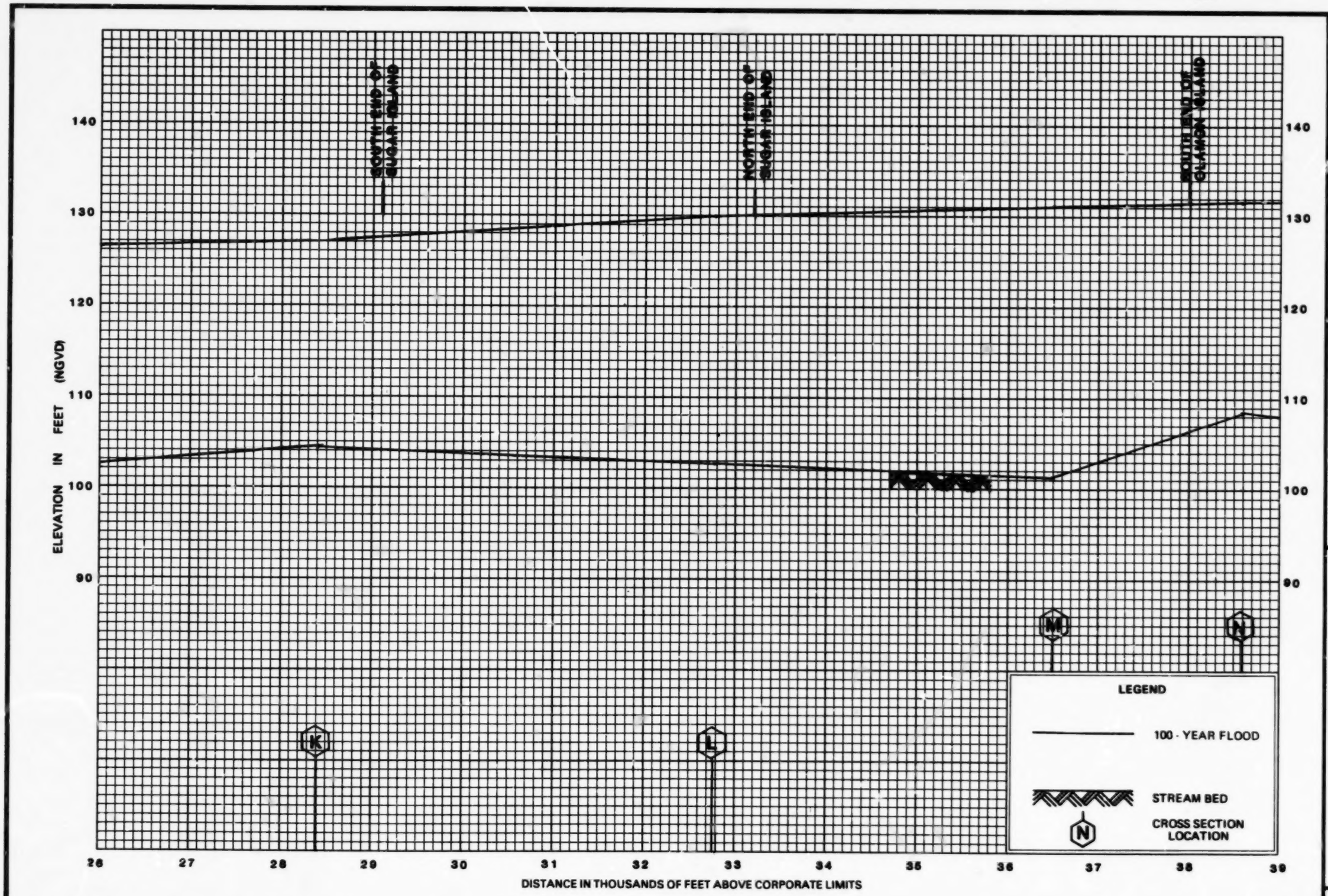

FLOOD PROFILES

PENOBSCOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GREENBUSH, MAINE
(PENOBSCOT COUNTY)

03P

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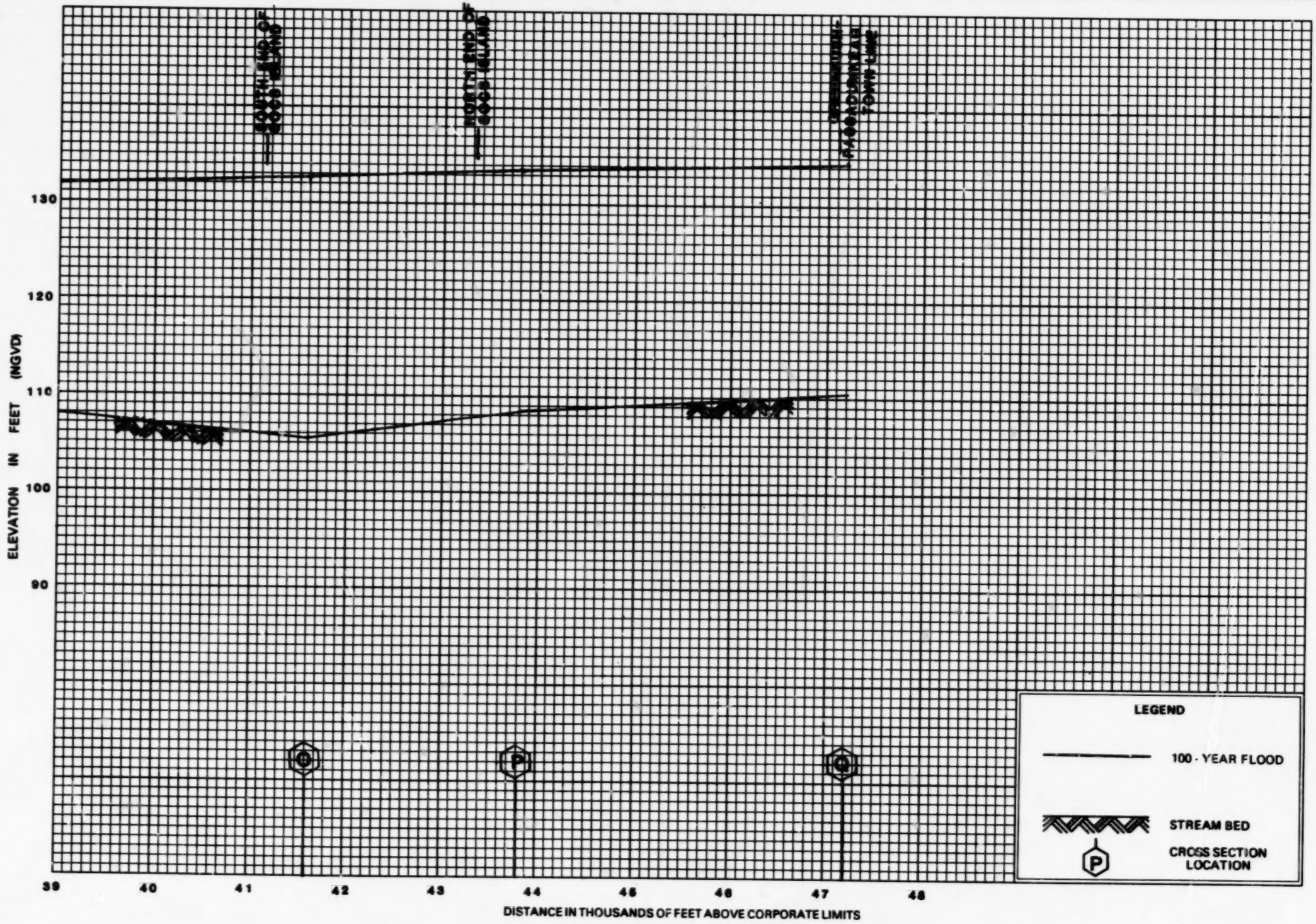

FLOOD PROFILES

PENOBSCOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GREENBUSH, MAINE

(PENOBSCOT COUNTY)

04P

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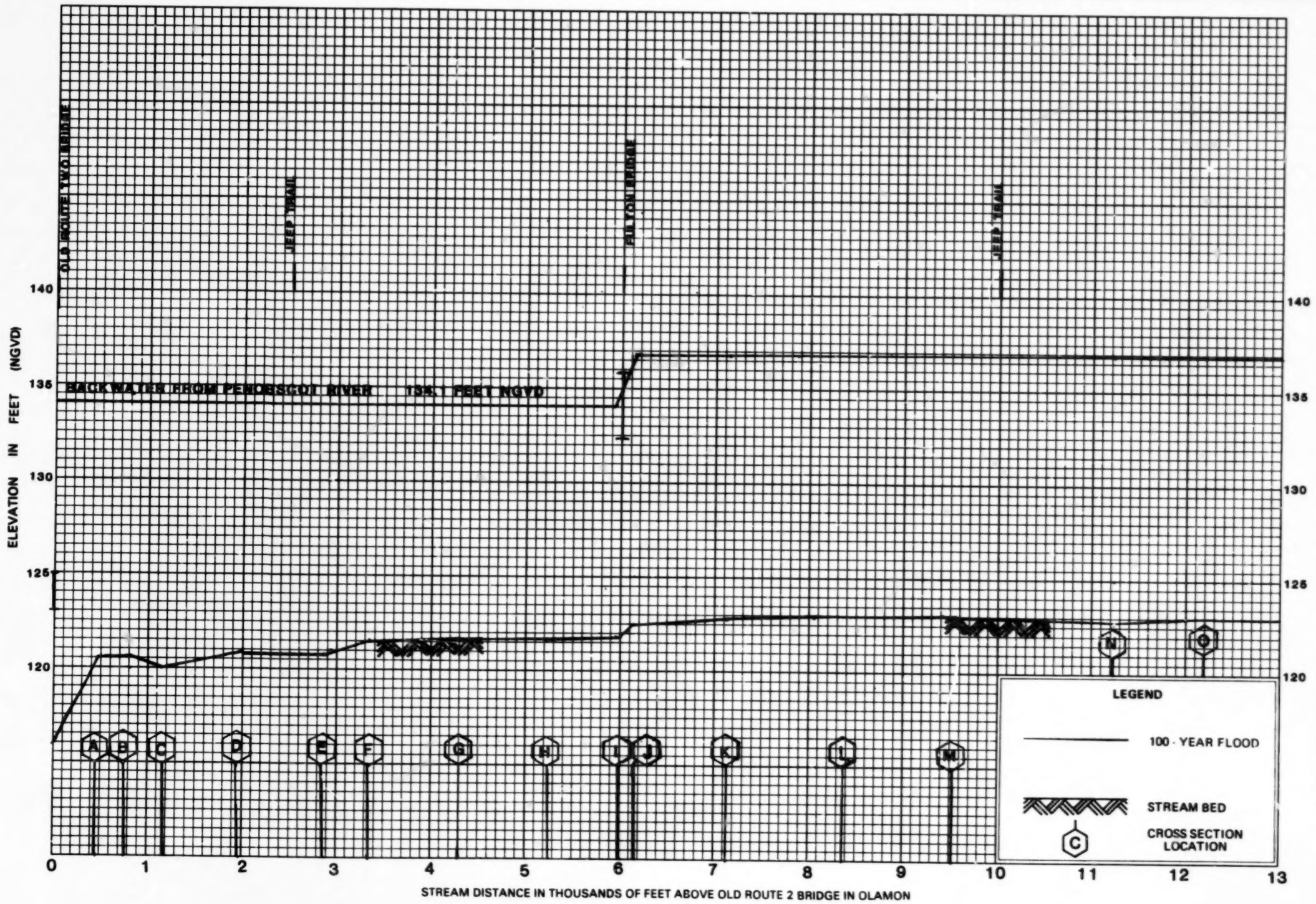

FLOOD PROFILES

OLAMON STREAM

FEDERAL EMERGENCY MANAGEMENT AGENCY

GREENBUSH, MAINE

(PENOBSCOT COUNTY)

05 P

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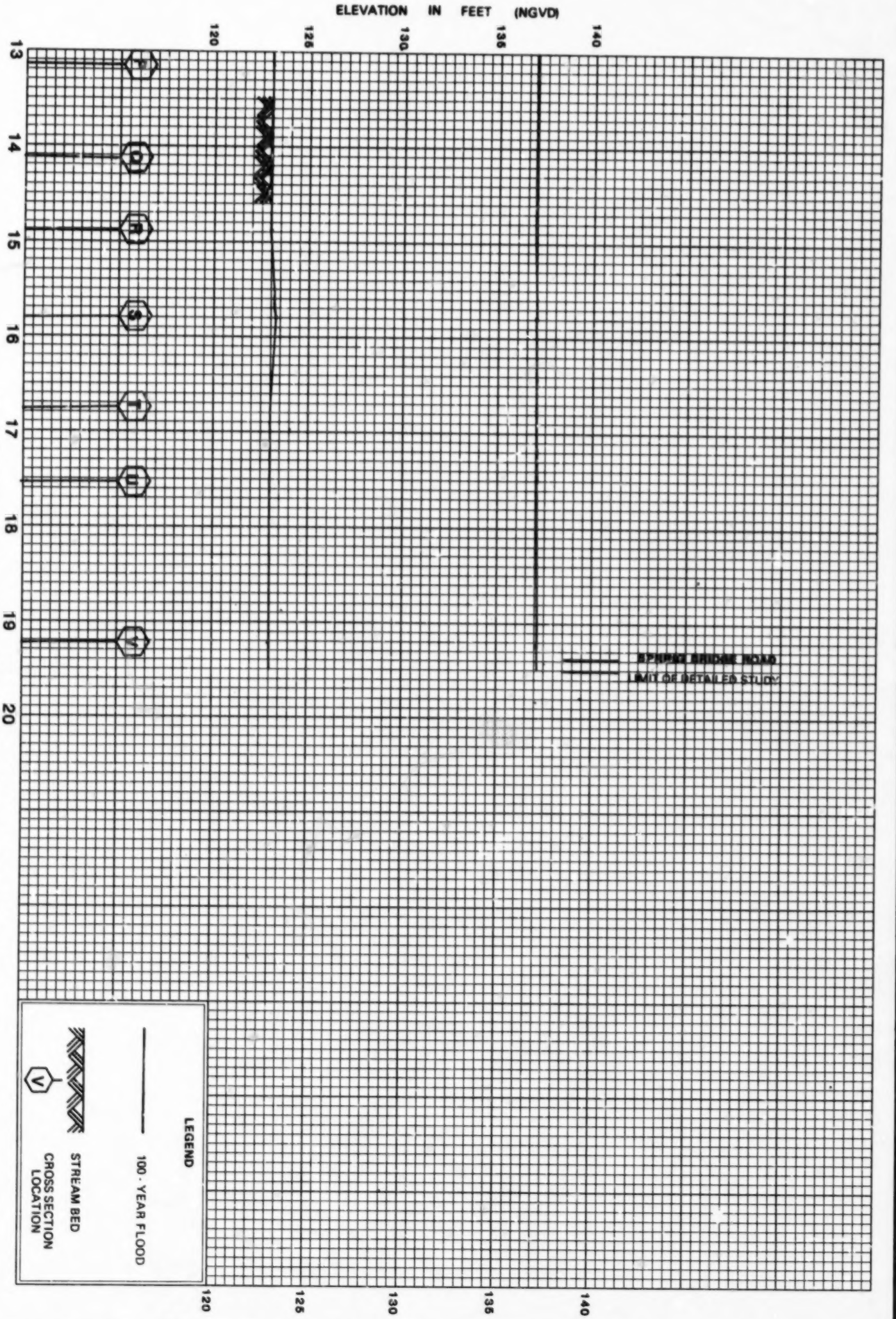

06 P	FEDERAL EMERGENCY MANAGEMENT AGENCY GREENBUSH, MAINE (PENOBSCOT COUNTY)	FLOOD PROFILES OLAMON STREAM

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